


What is claimed is:

1. A closed Brayton cycle power system ^() for powering an underwater craft comprising:

a liquid metal fuel;²²

an oxidant²² chemically reactive with said liquid metal fuel;

an  a working gas chemically stable and inert with respect to said oxidant and said liquid metal fuel;

a reactor/storage tank¹⁶ containing said liquid metal fuel therein and having a working gas inlet²⁸ and a working gas outlet³⁰, to allow said working gas to bubble ⁸
through said liquid metal fuel, for heating said working gas by direct contact with said liquid metal fuel;

an oxidant supply tank²² for storing said oxidant therein at high pressure;

an injector²⁶ disposed within said reactor/storage tank below the surface of said liquid metal fuel therein, said injector being in communication with said oxidant supply tank for injecting said oxidant into said liquid metal fuel;

a turbine³² having a turbine inlet and a turbine outlet, said turbine inlet being in communication with said working gas outlet of said reactor/storage tank for expanding said working gas and extracting power from said high pressure, high temperature working gas;

a regenerator¹⁶ having a hot side inlet, a hot side outlet, a cold side inlet, and a cold side outlet, said hot side inlet being in communication with said turbine outlet for receiving hot, expanded working gas from said turbine, said cold side outlet being in communication with said working gas inlet of said reactor/storage tank for preheating said compressed working gas;

a compressor¹⁴ having a compressor inlet and a compressor outlet, said compressor outlet being in communication with said cold side inlet of said regenerator for compressing said working gas;

a cooler³⁴ having a cooler inlet and a cooler outlet, said cooler inlet being in communication with said hot side outlet from said regenerator, said cooler outlet being in communication with said compressor inlet; and

a drive shaft¹² mechanically connected to said turbine
between said compressor for delivering power from said
turbine to said compressor and said underwater device.

2. The device of claim 1 further comprising an injection gas
mixing means²⁰ interposed between said working gas inlet and said
injector for mixing controlled portions of said working gas with
said oxidant to lower the temperature at said injector.

3. The device of claim 2 further comprising:

an accumulator³⁶ interposed between said compressor outlet
and said compressor inlet for controlling the amount
of working gas circulating in the system;

an accumulator inlet valve³⁶ in communication between said
accumulator and said compressor outlet, said
accumulator inlet valve being positionable to allow
compressed working gas to be withdrawn from said
Brayton cycle power system; and

an accumulator outlet valve⁴⁰ in communication with said
compressor inlet, said accumulator outlet valve being
positionable to allow working gas to be added to said
Brayton cycle power system.

Sub a'

46

removing liquor
er from said
e having a n

[illegible]

14

17

7. The device of claim 6 wherein the oxidant is O₂.

8. The device of claim 5 wherein the liquid metal fuel is an alkali metal.

9. The device of claim 8 wherein the oxidant is a chlorofluorocarbon.

Sub A2
10. In a closed Brayton cycle power system, a direct contact reactor/storage tank of the type wherein an oxidant is reacted with a liquid metal fuel comprising:

a working gas;

a housing containing said liquid metal fuel;

an injector disposed in said housing below the surface of said liquid metal fuel for injecting said oxidant into said liquid metal fuel;

an inlet bubbling tube having a multiplicity of apertures therethrough along the length thereof disposed below the surface of said liquid metal fuel in said reactor/storage tank for allowing said high pressure working gas to bubble through said liquid metal fuel; and

a working gas outlet disposed in said housing above the surface of said liquid metal fuel for allowing said heated working gas to exit said housing. 15 17

11. A direct contact reactor as in claim 10 further comprising:

a screen interposed between said liquid metal fuel and said working gas outlet for preventing particulate matter from entering said working gas outlet; and

a filter interposed between said screen and said working gas outlet for removing liquid metal vapors and particulate matter from said heated working gas.

12. The device of claim 11 wherein the working gas is a gas selected from a group consisting of argon, helium, neon, xenon and mixtures thereof with a molecular weight in the range of 20 to 50 grams/mole.